A SEARCH FOR SATURNIAN MOONLETS USING THE WIYN TELESCOPE. L. Dones, *SJSU Foundation and NASA*

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During and just after the crossing of the Sun through Saturn's ring plane in November 1995, we obtained about 200 CCD images of Saturn's satellite and ring system over a period of five nights at the 3.5-meter Wisconsin-Indiana-Yale-NOAO (WIYN) telescope at Kitt Peak. Our observations used a coronagraphic mask to reduce scattered light. Most images were taken in R-band or a narrowband 890-nm methane filter under sub-arcsecond seeing conditions.

The WIYN images are well-suited to detecting known small satellites of Saturn and for detecting possible new satellites, especially objects which might lie within the faint E Ring, which extends from about 3 to 8 Saturnian radii (R_S). For example, images in R-band with exposure times of 1-5 minutes show Tethys' tiny coorbital satellite Calypso (R magnitude $\sim$ 18 and mean radius $\sim$ 10 km) with signal-to-noise ranging from 30 to 80. Since we took several sequences of roughly ten images with identical viewing geometry, moving objects are easy to detect. Our orbital coverage is nearly complete in the range 2.5-5 R_S, allowing us to detect moons with radii larger than 3 km with signal-to-noise of 10. The range 2.5-5R_S contains a number of satellite candidates seen in Voyager images [1,2]. These moons could not be confirmed because of the limited Voyager coverage at these distances from Saturn, so the WIYN data complement Voyager well. In the region of the main rings, the methane images provide our best data set because this passband minimizes scattered light from Saturn. These images show clear detections of Janus, Epimetheus, Prometheus, and Pandora. (Selected WIYN images and an MPEG movie showing the orbital motion of several ring moons are available at http://astrowww.astro.indiana.edu/personnel/strom/saturn/.)

We will present our analysis of several image sequences, primarily in R-band, from which we will be able to constrain the population of moonlets within the E Ring. We blink the images to provide a initial set of moving objects in the frames. In order to detect faint objects, we then subtract median frames for the sequence from each image, revealing moving objects in the difference frames [3, 4]. As a byproduct of this analysis, we may detect clumps or arcs in the F Ring, some of which have integrated brightnesses comparable to or greater than that of Atlas [5].

References: [1] Synnott S. P. (1986). Icarus 67, 186-204. [2] Gordon M. K. et al. (1996). Icarus 121, 114-125. [3] Bosh A. S. and Rivkin A. S. (1996). Science 272, 518-521. [4] Nicholson P. D. et al. (1996). Science 272, 509-515. [5] Roddier C. et al. (1996). IAU Circular 6515.